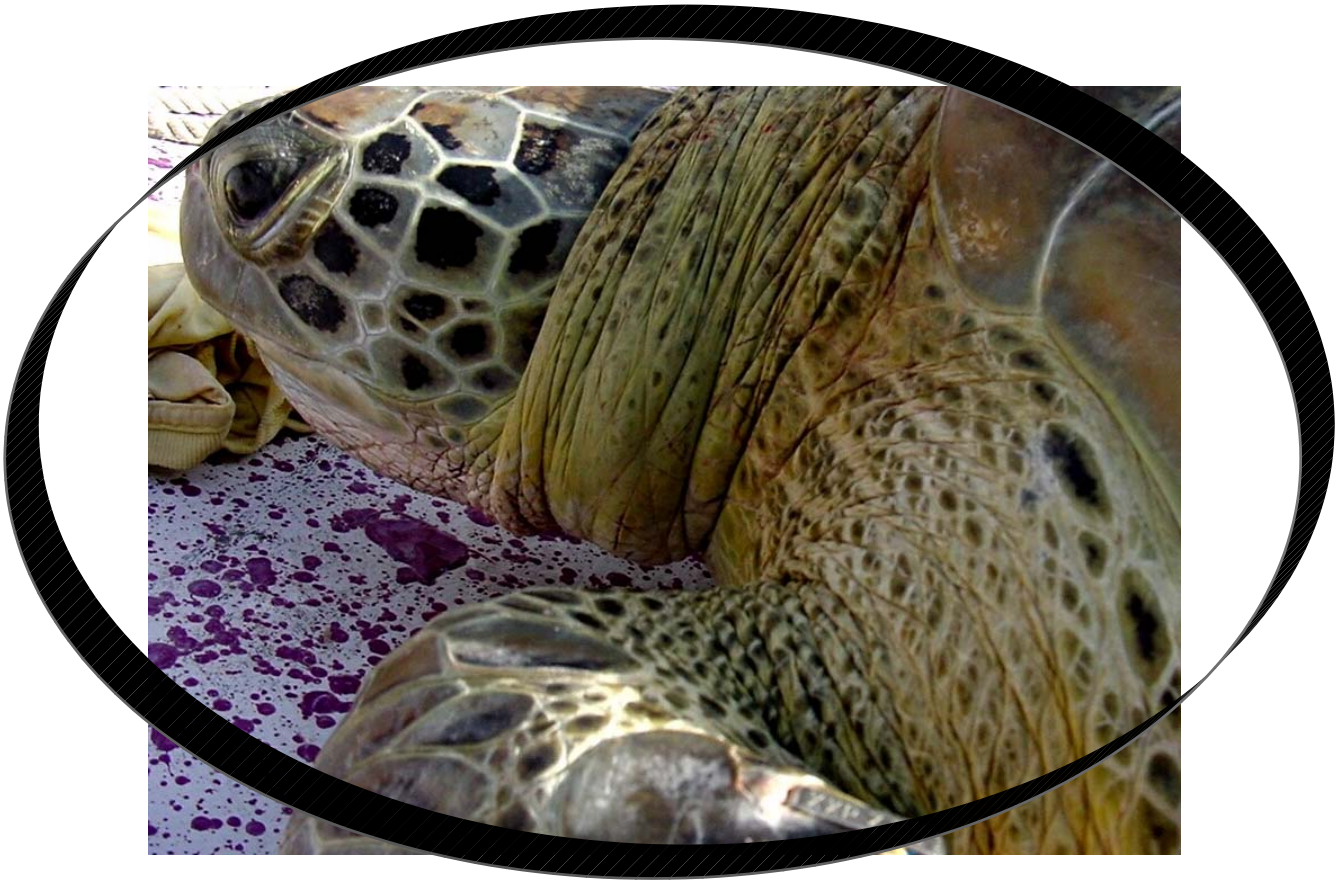
Aspects on the ecology and dynamics of juvenile green turtles (*Chelonia mydas*) at foraging grounds of Culebra Archipelago, Puerto Rico



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Progress Report for FY 01-02

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Introduction:

Last year in-water surveys were re-iniciated at Culebra Arhcipelago to evaluate aspects on the ecology and dynamics of juvenile and sub-adult green turtles. Specially, data on on size class composition, growth, and trends were gathered. This information together with other parametes would provide baseline habitat-species status parameters from which subsequent threats to habitat and species integrity can be determined.

The following report summarizes the result for the fiscal year 2001-2002 and comparisons with other seasons are made when appropiate. It is hoped that the information gained from this study along with additional years of research will produce adequate sample sizes for interpretation of trends and other population parameters. In addition, data gathered from this research can be utilized by municipal and Commonwealth agencies in the formulation of coastal management plans for the Culebra Island Archipelago.

Methods and Results

Study site:

The Culebra Archipelago es located at 30 km from Puerto Rico's east coast (Fig 1). Sea grasses and coral reefs surround the Archipelago, which is composed of more than 9 cays. Three study sites were selected from previous studies. These sites are Mosquito, Puerto Manglar, and Culebrita (see Fig 1). The depth of all sites varies from 8 to 15 meters.

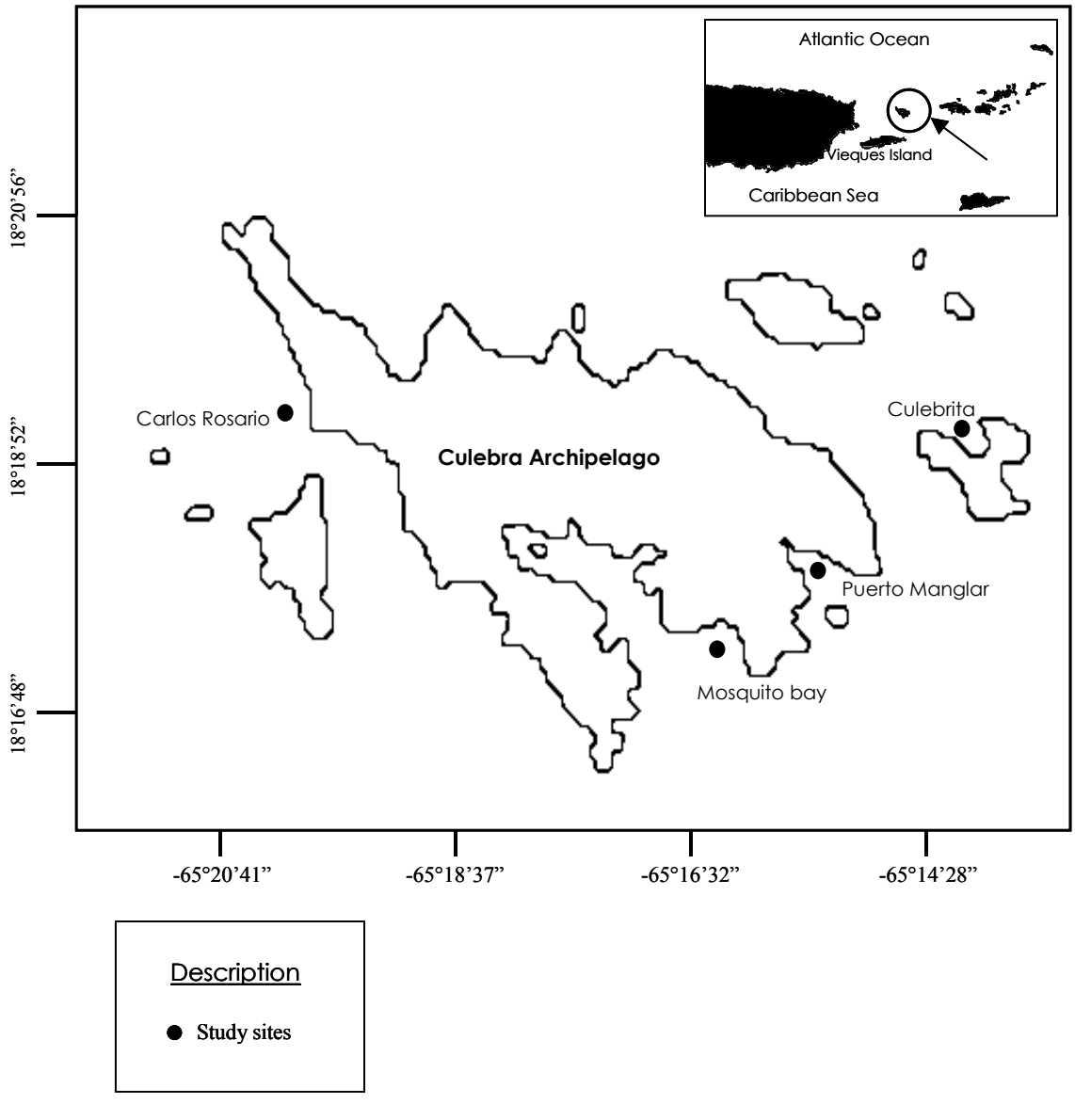

Figure 1. Map with area and study sites at Culebra Archipelago, Puerto Rico, 2001-2002

Turtle captures and biometrics:

We used two boats of 16", 17" and 28" length to conduct the surveys. The methodology followed for capture and recapture of green turtles was adapted from the one used by Collazo et al. (1992). At the study sites, a net of 200 m length and 5 meter depth (#18 nylon, 16" stretch mesh) was deployed parallel to the shore in an area with similar net-depth, sometimes shallower. An average of 7 (6-10) swimmer snorkeled along the net watching the turtles when encountering it. On Culebrita 3 swimmers snorkeled from and to the shore looking for turtles and directing them to the net whihle in Mosquito Bay and Manglar noise from the boats make turtles move toward the net. Once captured, each turtles was taken to one of the boats for measuring and tagging protocols.

The net was set once (Mosquito Bay, Pto Manglar) and twice (Culebrita) on each session. The surveys were conducted for two days in November 2001 and June 2002. Catch per unit of effort assessments (see Table 1) were made by dividing the total number of turtle captures with the survey session (net set x day x area). In order to evaluate trends of data collected in past years (see Collazo et al. 1992); we calculated the effort (defined as catch per net set) by dividing the total number of turtle captures with the total sampling occasions during the given field season (see Table 2). The CPUE in both tables suggests Puerto Manglar, as the site with the highest amount of turtles per net set, and Bahía Mosquito with the least

Table 1. Catch per unit effort at Culebra Archipelago, 2002

Site	Total Captures	Catch per net set 2002	Catch per net set (2000-2001)	Catch per net set (1987-1989)
Mosquito	10	0.25	0.33	2.16
Manglar	71	3.60	3.50	0.86
Culebrita	68	3.00	1.72	2.04

Table 2. Green turtles captured per net set at Culebra, Puerto Rico, 1987-2002.

Site	Mean CPUE	STD	SE	size	min	max
Mosquito	0.17	0.29	0.17	3	0	0.5
Manglar	3.6	2.41	1.08	5	1	7
Culebrita	3	1.87	0.94	4	1	5.5

During FY 00-02-field season a total of 40 green turtles were captured during the net sessions (see Table 3) with 19 (47.5%) turtles being captured for the first time. Twenty-one turtles (52.5%) were recaptures from previous years (Appendix I). Green turtles ranged in size from 30.8 to 83 cm (mean = 47.4cm) N-T SCL (Fig. 2). Size distribution of the total of captures since 2000 (n=123) are shown in figure 3 and a comparison between the size distribution of green turtles captured in 2001 and 2002 in figure 4. Two hawksbills were caught in Manglar study site (51.5 cm and 62.0 cm SCL notch-tip).

Table 3. Green turtles capture per site during season 2002

Date	location	captures
Nov 13-14	culebrita	12
Nov 13-14	manglar	12
Nov 13-14	mosquito	1
Jun 05-07	culebrita	11
Jun 05-07	manglar	4
Jun 05-07	mosquito	0
	Total	40

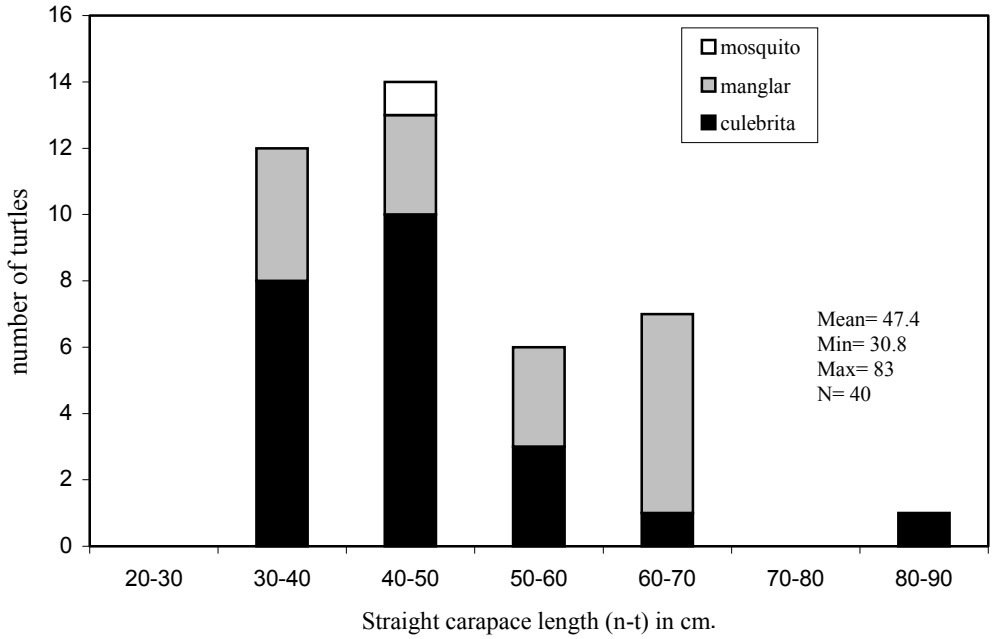

Figure 2. Size distribution of 40 green turtles captured in study sites during FY 01-02

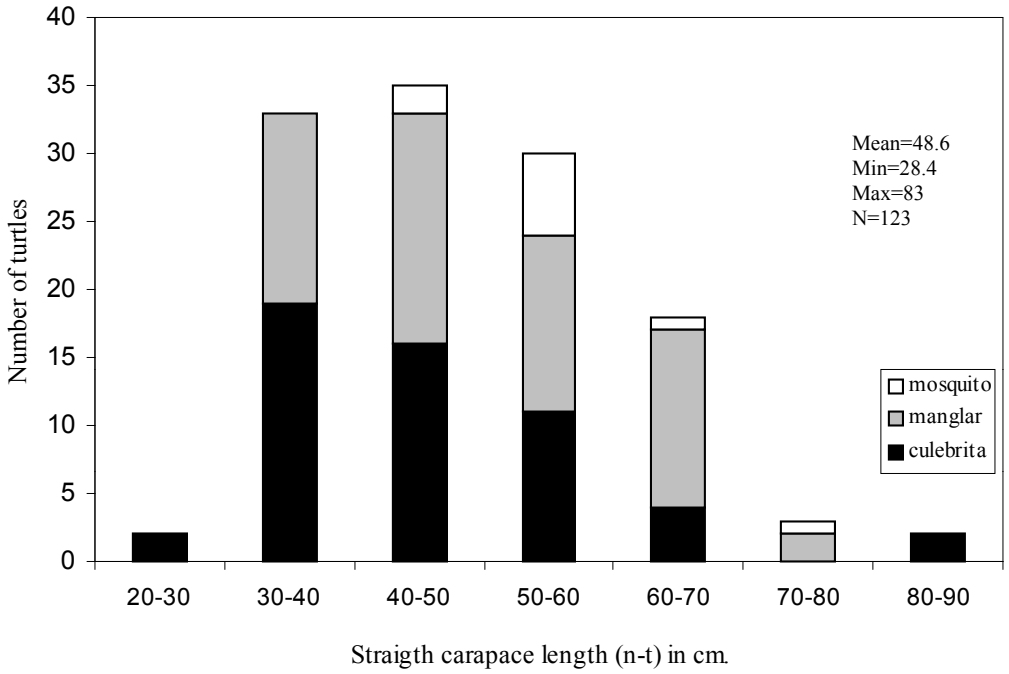

Figure 3. Size distribution of 123 green turtles at study sites, 2000-2002

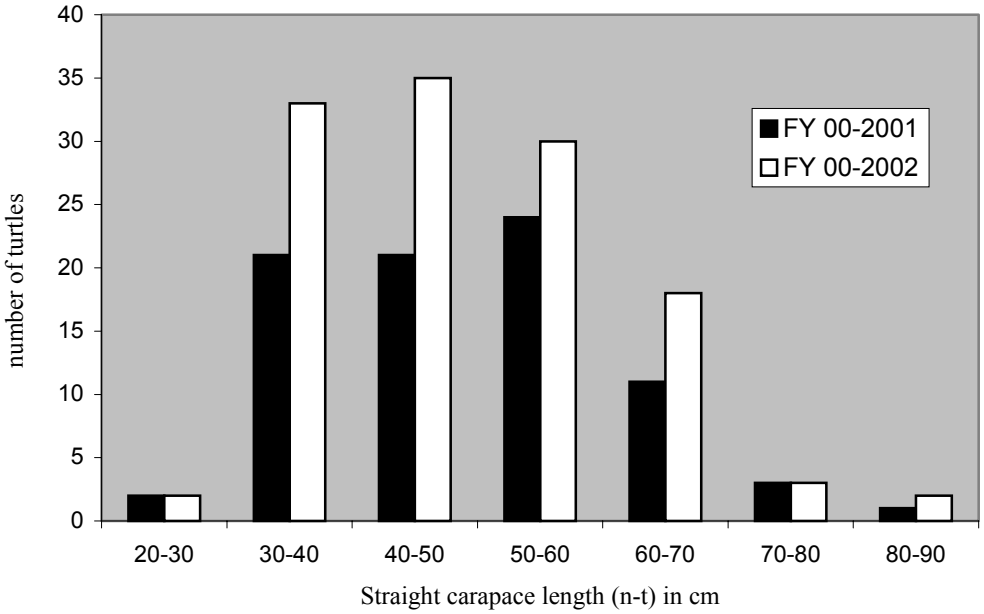

Figure 4. Comparison of size distribution of green turtles captured during seasons 2001-2002

Turtles were measured with calipers to obtain straight lengths of the carapace, weighted and tagged on both flippers with small Monel tags prior to release. In addition, juvenile and sub-adult turtles were injected with Passive Integrated Transponder (PIT tags, AVID brand) in their front right flipper muscle (Appendix I).

Blood sampling:

Blood samples were collected for seventeen (17) individuals for both, sex and DNA studies. Analysis of these materials through genetic profiling may allow us to relate this aggregation of juveniles' green turtles to others among the Caribbean-Atlantic Region. Serum samples would be used for sex determination through testosterone assays. These samples were sent to Dave Owens at University of North Carolina (the results were not available by time this report was written). See appendix II for list of turtles bled.

Other observations:

-*Fibropapillomas*

Eigth green turtles were observed with fibropapillomas (FP) tumors at Puerto Manglar and none in the other sites. Four of them were new captures (see Appendix III). This is not the first observation of tumors in green turtles in the site; the report for FY 00-2001 documented three turtles with tumors; however the tumors were more conspicuos than the first time it were reported (see Appendix IV). Samples of tumor as well as skin tissue were collected for biopsy. The samples were sent to Dr James Casey at Cornell University for pathological analysis (the results were not available by the time this report was written).

-*Hawksbills in-water surveys*

In addition to the netting sessions, surveys to continue the evaluation of hawksbill turtles at Carlos Rosario Marine Reserve were conducted (Fig 1.). The surveys started in 2000 following the same methods as in Mona-Monito and Desecheo Islands (Diez and Van Dam, 2000). Table 4 summarizes the CPUE for hawksbills in-water surveys at Carlos Rosario Marine Reserve. A total of seven hawksbills were captured during 4 hours of in-water surveys. Four turtles were recaptured. The size range for all turtles captured was 30.7 to 39.7 cm SCL (notch-tip).

Table 4. CPUE for hawksbill turtles captured at Carlos Rosario Marine Reserve. CPUE was calculated by dividing the number of turtles (whether captured or not) by the total time of each survey (hours).

Year	Hours of surveys	Number of hawksbills (captured and seen)	CPUE
1997	1.5	3	2.0
2000	5.5	11	2.0
2001	1	4	4
2002	2	6	3

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Appendix I. Comprehensive list of green turtles captured at Culebra Island during FY 00-02

Site	Date	L-tag	R-tag	Pit tag #	Capture	N-T SCL cm.
manglar	13-Nov-01	xxp737	bp9128		New	42.5
manglar	13-Nov-01	ppm267	nnw247		Recapture	37.6
manglar	13-Nov-01	xxn855	xxn854	041060283	Recapture	61.5
culebrita II	13-Nov-01	xxp735	bp9127		New	39.3
culebrita II	13-Nov-01	xxp734	bp9126		New	43.9
manglar	13-Nov-01	xxp740	bp9132		New	64.4
manglar	13-Nov-01	xxp738	bp9129		New	35.7
manglar	13-Nov-01	xxp739	bp9131		New	
manglar	13-Nov-01	xxp736	bp9137		New	39.1
mosquito 1	14-Nov-01	xxp749	bp9139		New	42.8
culebrita II	14-Nov-01	xxp713	xxp714	050316555	Recapture	44.8
manglar	14-Nov-01	nnw244	nnw245	048826089	Recapture	44.3
manglar	14-Nov-01	ppm239	ppm235	040077632	Recapture	57.7
culebrita I	14-Nov-01	xxn885	xxn886	050023571	Recapture	32
manglar	14-Nov-01	bp9138	xxp748	040100381	Recapture	62.2
culebrita I	14-Nov-01	bp9134	xxp708	050315894	Recapture	39.9
culebrita I	14-Nov-01	xxn889	xxn890	050076343	Recapture	44
culebrita I	14-Nov-01	xxn813	xxn814	048890519	Recapture	40.4
culebrita II	14-Nov-01	xxp746	xxp745	049072276	New	30.8
culebrita II	14-Nov-01	xxp744	bp9135		New	35
culebrita II	14-Nov-01	xxp743	bp9130		New	51.2
culebrita I	14-Nov-01	xxp741	bp9133	050319332	New	37.1
culebrita II	14-Nov-01	xxn887	xxn888	050112773	Recapture	47.3
manglar	14-Nov-01	xxp747	bp9136		New	38.7
manglar	14-Nov-01	ppy327	ppm408	114519455A	Recapture	61.2
manglar	05-Jun-02	bp9150	xxp755	050077568	New	42.1
culebrita	06-Jun-02	xxn885	xxn886	050023571	Recapture	34
culebrita	06-Jun-02	bp9143	xxp759	050122345	Recapture	40.9
culebrita	06-Jun-02	bp9142	xxn809	050074615	Recapture	52
manglar	06-Jun-02	bp9147	xxp762	050079262	New	58.8
culebrita	06-Jun-02	xxn813	xxn814	048890519	Recapture	41.9
manglar	06-Jun-02	bp9148	xxp763	050011558	New	54.4
culebrita	06-Jun-02	bp9144	bp9133	050319332	Recapture	37.9
culebrita	06-Jun-02		bp9141	050085321	New	55.5
culebrita	07-Jun-02	bp9154	xxp769	050115840	Recapture	41.6
manglar	07-Jun-02	xxp725	xxp764	050289784	Recapture	61
culebrita	07-Jun-02	bp9161	xxp767	050263558	New	45.6
culebrita	07-Jun-02	bp9160	xxp768	113666711A	Recapture	62.7
culebrita	07-Jun-02	bp9162	xxp766	050265800	New	40.7
culebrita	07-Jun-02	xxp731	xxp730		Recapture	83

Appendix II. Blood samples collected from green turtles for DNA and sex analysis.

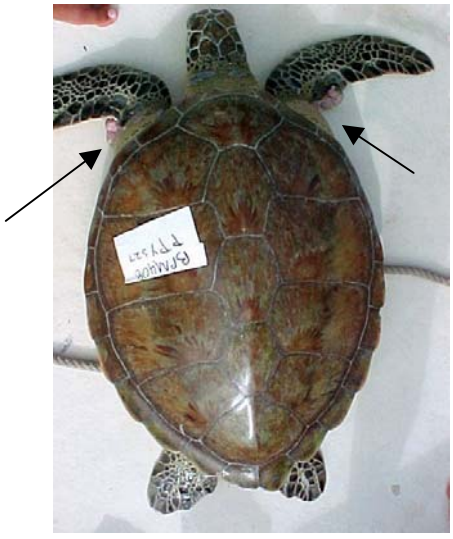
Left tag	Right tag	capture	spp	date	site	sample
xxp734	bp9126	New	cm	11/13/01	culebrita II	buena
xxp746	xxp745	New	cm	11/14/01	culebrita II	buena
bp9142	xxn809	Recapture	cm	6/6/02	culebrita	buena
bp9154	xxp769	Recapture	cm	6/7/02	culebrita	buena
bp9143	xxp759	Recapture	cm	6/6/02	culebrita	buena
xxn885	xxn886	Recapture	cm	6/6/02	culebrita	buena
xxp725	xxp764	Recapture	cm	6/7/02	manglar	buena
xxp731	xxp730	Recapture	cm	6/7/02	culebrita	buena
bp9144	bp9133	Recapture	cm	6/6/02	culebrita	buena
bp9150	xxp755	New	cm	6/5/02	manglar	buena
bp9147	xxp762	New	cm	6/6/02	manglar	buena
bp9148	xxp763	New	cm	6/6/02	manglar	buena
xxp761	xxp760	New	ei	6/6/02	manglar	buena
bp9153	xxp765	New	ei	6/7/02	manglar	buena
bp9161	xxp767	New	cm	6/7/02	culebrita	buena
	bp9141	New	cm	6/6/02	culebrita	minima
bp9162	xxp766	New	cm	6/7/02	culebrita	minima

Appendix III. Comprehensive list of green turtles reported with fibropapillomatosis tumors at Pto. Manglar.

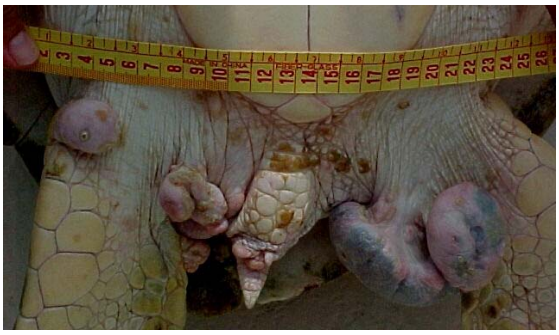
Capture	date	Site	Left tag	Right tag	Pit tag .
New	11/13/01	manglar	xxp740	bp9132	none
New	11/13/01	manglar	xxp739	bp9131	none
Recapture	11/14/01	manglar	bp9138	xxp748	040100381
Recapture	11/14/01	manglar	ppm239	ppm235	040077632
Recapture	11/14/01	manglar	ppy327	ppm408	114519455A
Recapture	6/7/02	manglar	xxp725	xxp764	050289784
New	6/6/02	manglar	bp9147	xxp762	050079262
New	6/6/02	manglar	bp9148	xxp763	050011558

Appendix IV. Pictures of FP tumors in green turtles capture at Pto Manglar in June 2000 and November 2001.

A. Turtle captured in June 27, 2000 at Pto Manglar. In that time no tumors or abnormalities were reported



B. The same turtles recaptured in Nov 14, 2001 with tumors in both front flippers and around the caudal area.



C. Detail of the caudal area showing the tumors that developed in less than 17 months.